Environmental Program

Holger Fischer

575-524-5290

List of Permits

- 12 Permits (8 specifically support test operations)
  - NM8800019434-1: RCRA permit for 200 Area evaporation tanks
  - NM8800019434-1: RCRA permit for 500 Area hydrazine storage tanks
  - NM8800019434-2: RCRA post-closure care permit for 5 closed units
  - DP-392: Wastewater discharge permit for 6 site-wide operating sewage lagoons
  - DP-584: Wastewater discharge permit for STGT operating sewage lagoon
  - DP-697: Wastewater discharge permit for Test Stand 302 cooling pond
  - DP-1170: Wastewater discharge permit for 400 Area pond system

List of Permits

- DP-1255: Discharge permit for injection of treated groundwater
- 629-M-3(a): Air permit for Test Stand 302 cooling tower
- 629-M-3(b): Air permit for Test Stand 302 boiler system
- 629 Area 400-M-1(a): Air permit for 400 Area boiler system
- 629 Area 400-M-1(b): Module minute limitations for chemical steam generator
- 629 Area 800: Air permit for Test Cell 844 emissions
- Area 700-HEBF: Air permit for 700 Area explosion testing operations
- 700-PCC: Post-closure care permit for closed solid waste landfill

Environmental Compliance Program

- Six WSTF Core Capabilities:
  - Remote Hazardous Testing of Reactive, Explosive, and Toxic Materials and Fluids
  - Hypergolic Fluids Materials and Systems Testing
  - Oxygen Materials and System Testing
  - Hypervelocity Impact Testing
  - Flight Hardware Processing
  - Propulsion Testing

Remote Hazardous Testing of Reactive, Explosive, and Toxic Materials and Fluids

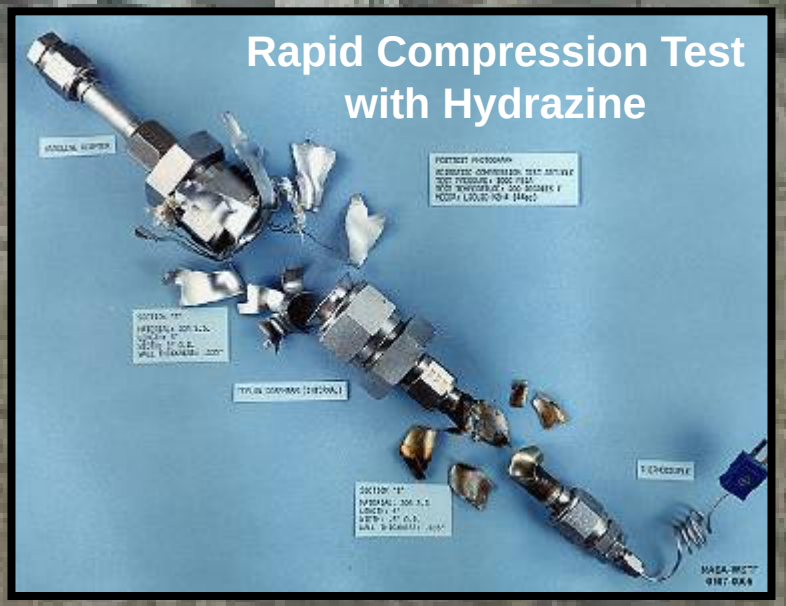
Enabling:

- Toxic and Criteria Emissions Permit (Area 700-HEBF)
- Hazardous Waste Operating Permit (NM8800019434-1)

Hypergolic Fluids Materials and Systems Testing

Enabling:

- Toxic and Criteria Emission Permit (629 Area 800)
- Hazardous Waste Operating Permit (NM8800019434-1)
- Grandfathered Status for Historical Emissions

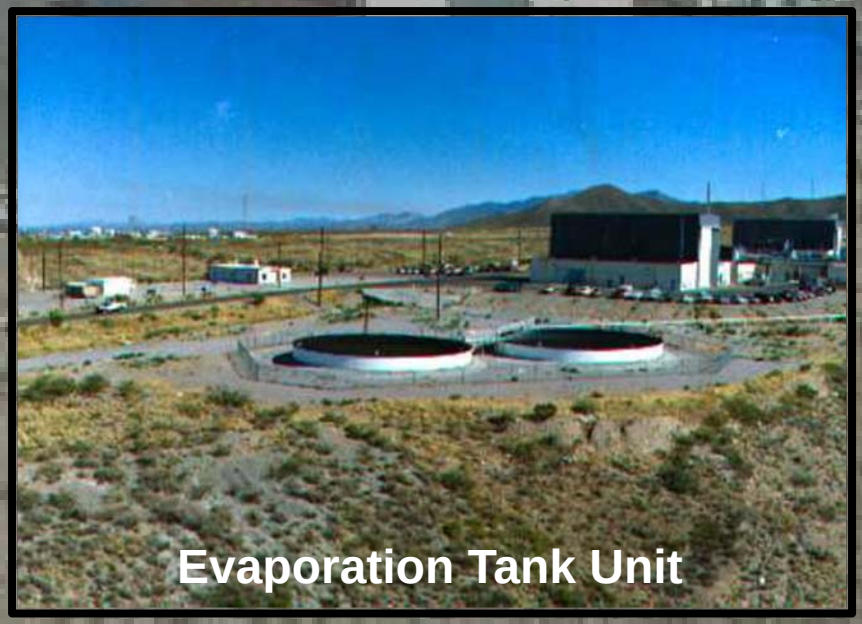


Hypergolic Fluids Materials and Systems Testing (cont'd)

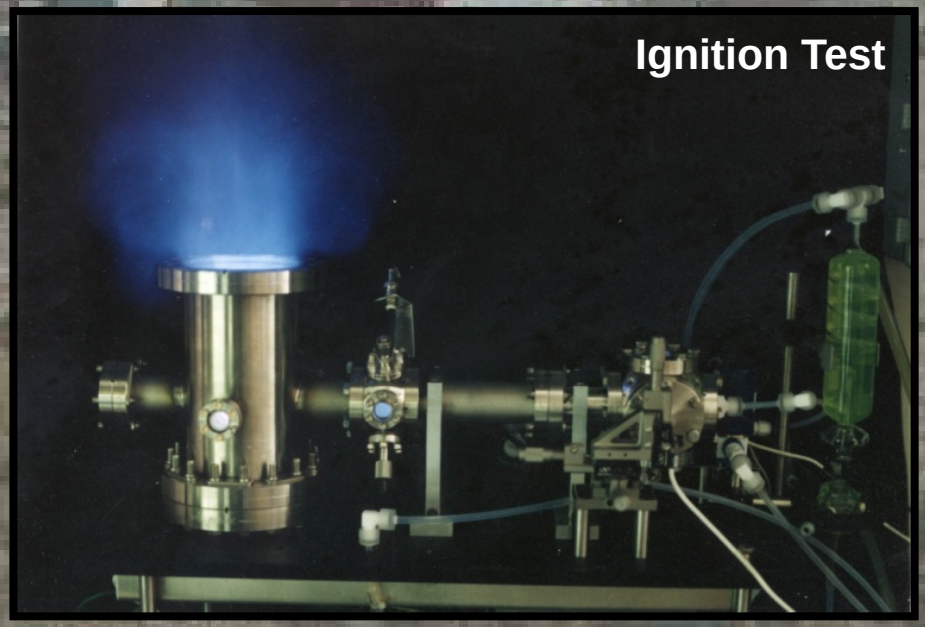
Enabling:

- Hazardous Waste Operating Permit (NM8800019434-1)
- Grandfathered Status for Historical Emissions

NASA-STD-6001 Test

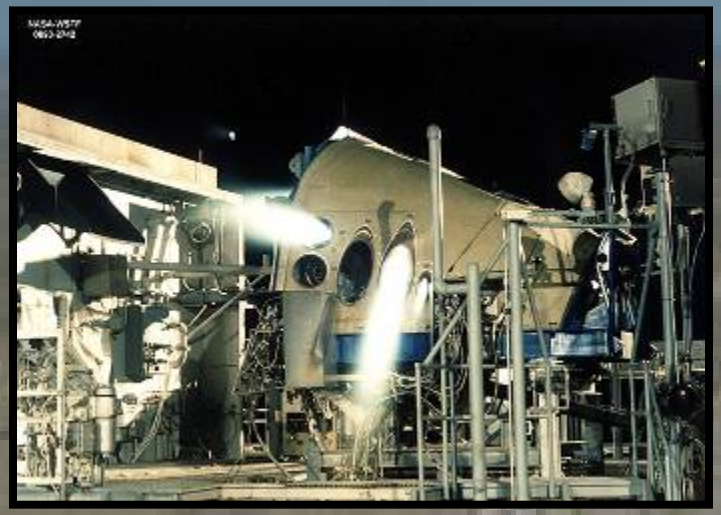


Evaporation Tank Unit



Ignition Test

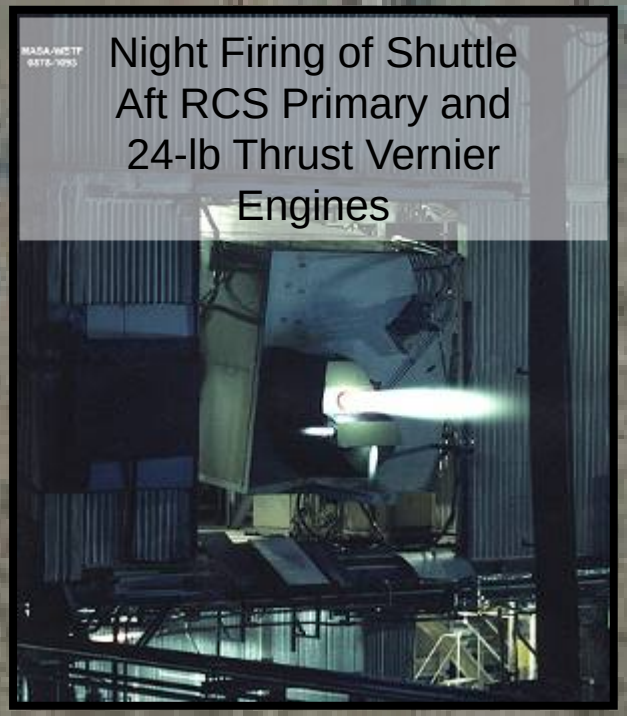
300 Propulsion Testing



Night Firing of Shuttle Forward RCS Primary and Vernier Thrusters

Enabling:

- Toxic and Criteria Emission Permit (629-M-3)
- Discharge Permit (DP 697)
- Hazardous Waste Operating Permit (NM8800019434-1)
- Grandfathered Status for Historical Emissions



Night Firing of Shuttle Aft RCS Primary and 24-lb Thrust Vernier Engines

400 Propulsion Testing

Static firing of DC-X with 4 LOX/Hydrogen RL10-A5 engines

Enabling:

- **Toxic and Criteria Emission Permit (629 Area 400-M-1)**
- **Discharge Permit (DP 1170)**
- **Hazardous Waste Operating Permit (NM8800019434-1)**
- **Grandfathered Status for Historical Emissions**

500 Fuel Treatment Unit

Cassini - Saturn orbit insertion engine glows during 3 h 20 min continuous firing

Flight Hardware Processing

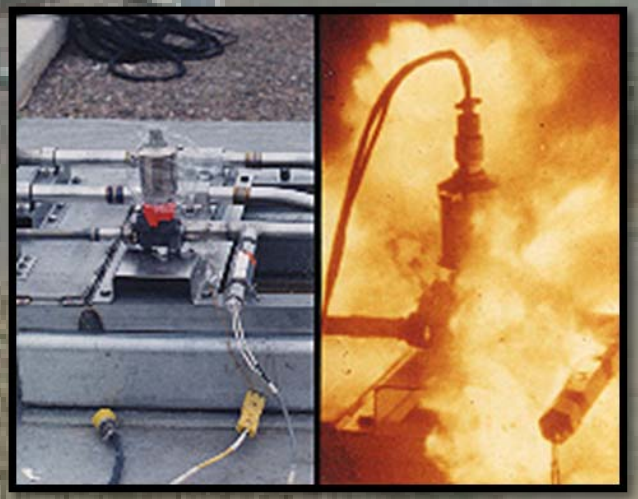
Enabling:

- Currently: Hazardous Waste Operating Permit (NM8800019434-1)
- Waste Management Generator Requirements could be accomplished without an operating permit

Oxygen Materials and System Testing

Enabling:

- Currently: Hazardous Waste Operating Permit (NM8800019434-1)
- Waste Management Generator Requirements could be accomplished without an operating permit



Hypervelocity Impact Testing 270/272

Enabling:

- Currently: Hazardous Waste Operating Permit (NM8800019434-1)
- Waste Management Generator Requirements could be accomplished without an operating permit

Permit/Grandfathered Status & Challenges

- Hazardous Waste Operating Permit
  - Application fee: ~$75K/10yr
  - Operational costs: ~$0.5-1M/yr
  - Current risks:
    - NMED's Draft Permit contained significant operational changes that if implemented, could result in cost increases up to several million dollars (One-time costs + procedural changes)
    - Prepared for negotiations – waiting on NMED to set dates
- Air Permits
  - Requires: Valid testing using system every 5 years

Permit/Grandfathered Status

- Discharge Plans
  - Renewed every 5 years, not dependent on testing
  - Operational costs: ~$25K/yr
- Grandfathered Status
  - Priceless
    - Requirement: perform valid test within area every 5 years to maintain status
    - Loss of status is permanent

Environmental Program

- Restoration Program
  - Background
  - Plume Front Treatment System
    - Renewable energy
  - Mid-Plume Interception Treatment System
    - Innovative treatability studies
  - Other Clean-up Activities
  - Challenges

Restoration Program

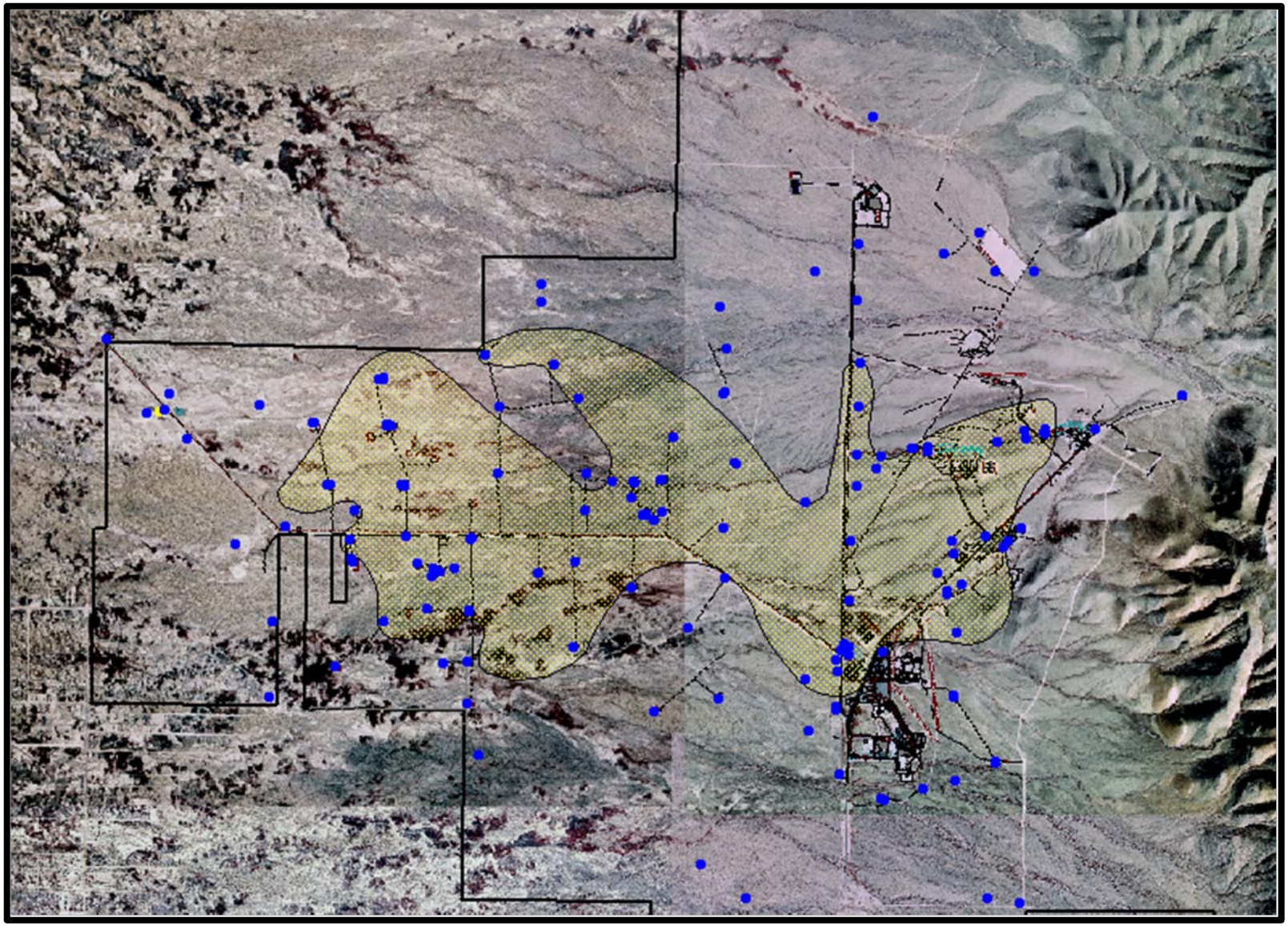
- Historic operations and practices beginning in the 1960s (through the early 1980s) resulted in contamination of WSTF's groundwater.
  - Propulsion system testing programs:
    - N-Nitrosodimethylamine (NDMA)
    - Dimethylnitramine (DMN)
  - Component servicing and cleaning operations:
    - Trichloroethene (TCE)
    - Tetrachloroethene (PCE)
    - Freons (11, 21, and 113)
- WSTF contaminated ground water is NASA HQ's greatest liability (estimated at $350M)

Environmental Restoration

- Priority: Protect the public's health and the health of our workforce
  - Stop Unhealthy Practices
    - Proper hazardous materials and waste processes
  - Determine Nature & Extent
    - Measure, Model, and Monitor (over 106 records)
  - Containment
    - Stop the migration of contaminated groundwater
    - Greatest health-risk liability pursued initially
      - Plume Front
      - Mid-Plume
      - Source Areas
  - Restoration
    - Clean-up the environment to preexisting conditions

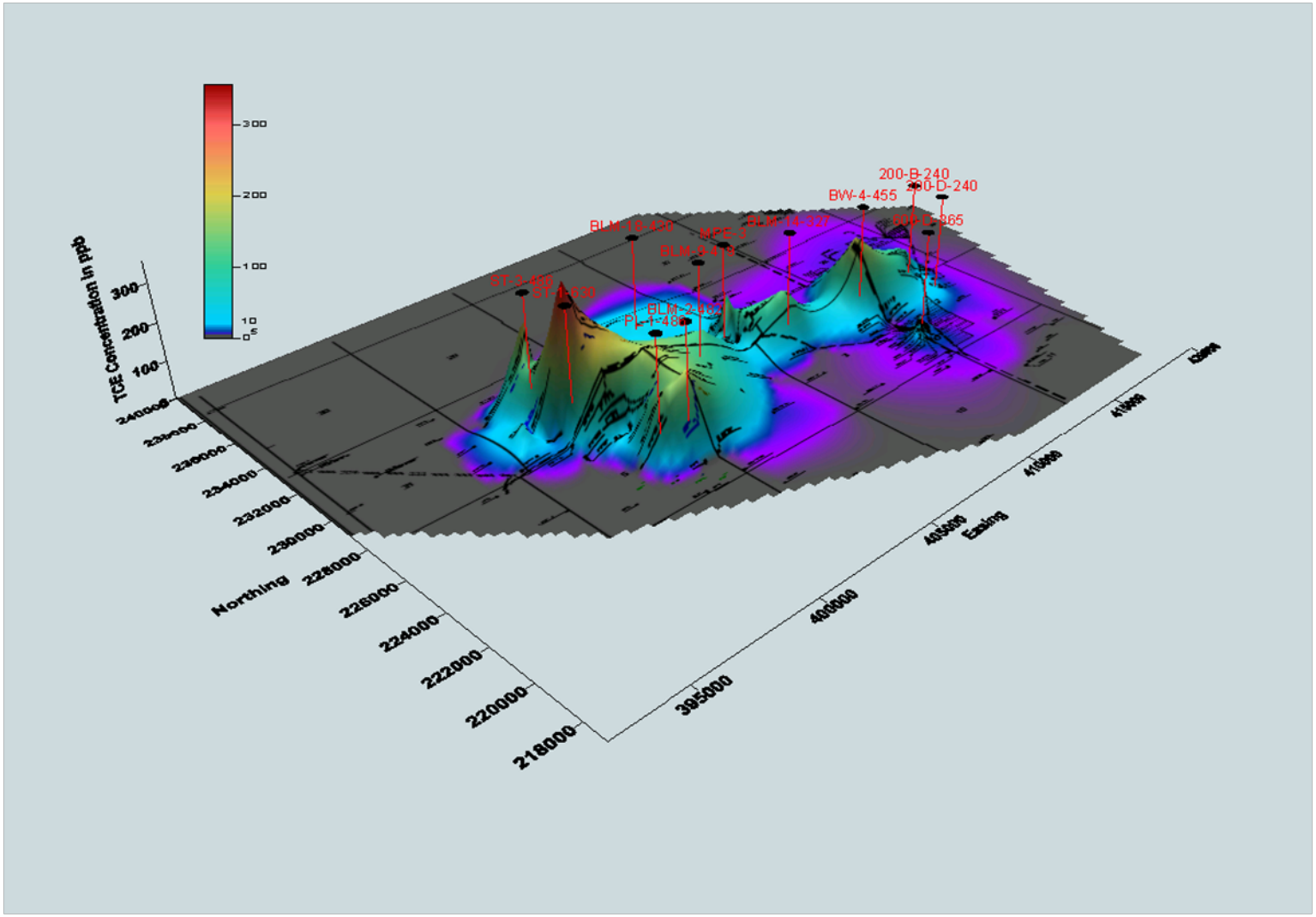
Closed Source Areas (Stop Unhealthy Practices)

- Three underground storage tanks in 200 area (2 closures)
- Ponds and mixing tank in 300 area
- Ponds and mixing tank in 400 area
- Two connected ponds in 600 area
- Old Landfill



Determine Nature & Extent (150/220 locations, TCE plume)

TCE Concentration in ppb (Using Surfer 8.0)



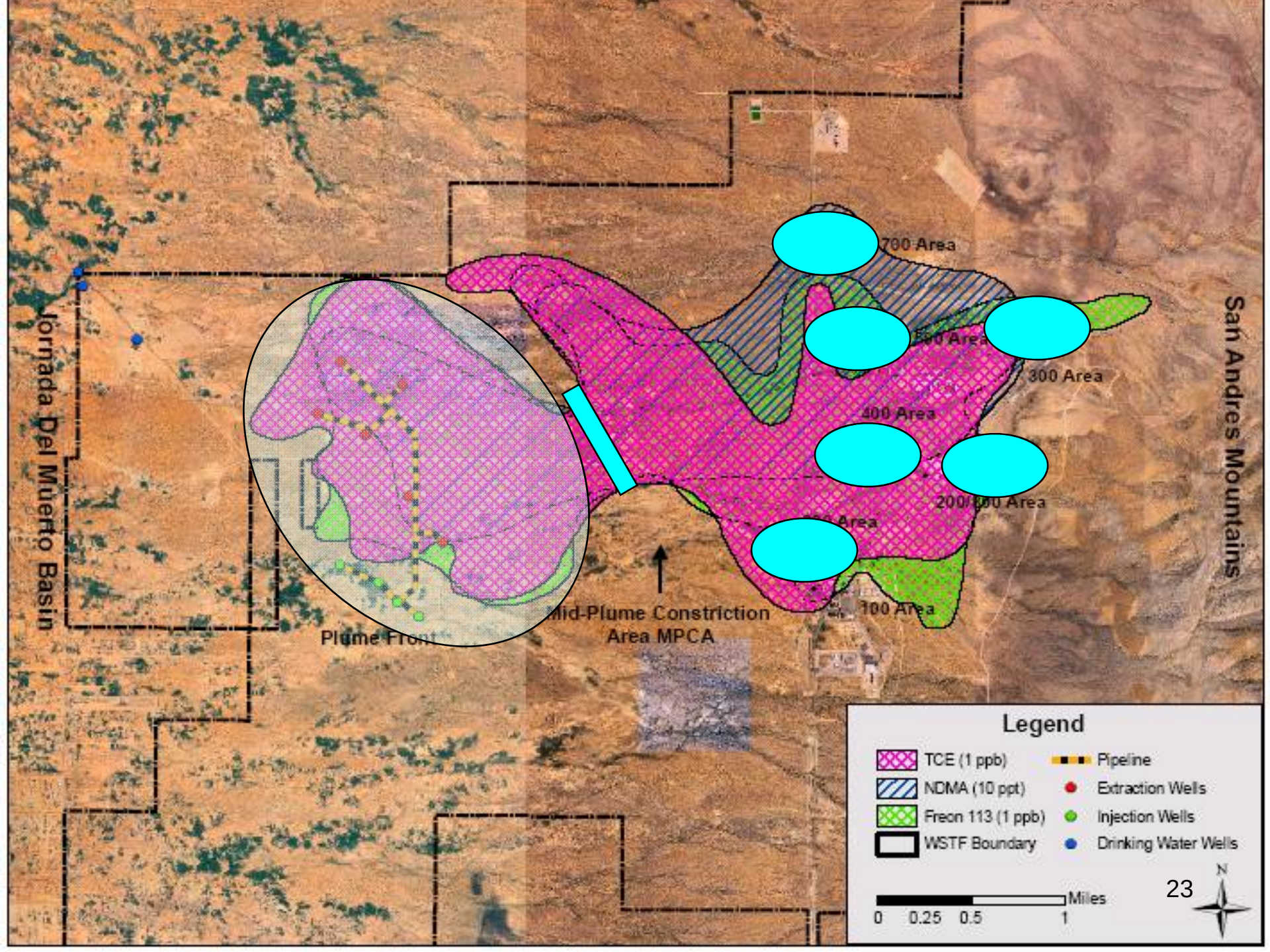
Determine Nature & Extent

Public and Employee Assessment

- No impact to any drinking water well
  - Includes public wells and the NASA supply well
- No public exposure
  - Groundwater is several hundred feet below ground
  - No air or surface water exposure
  - Plume is moving very slowly to the west
    - Plume Front Treatment System will stop this westward movement
- NASA performs on-going monitoring
  - More than 200 wells and zones are routinely sampled
  - ~850 samples are obtained monthly and analyzed for over 300 different hazardous chemicals

Containment and Restoration

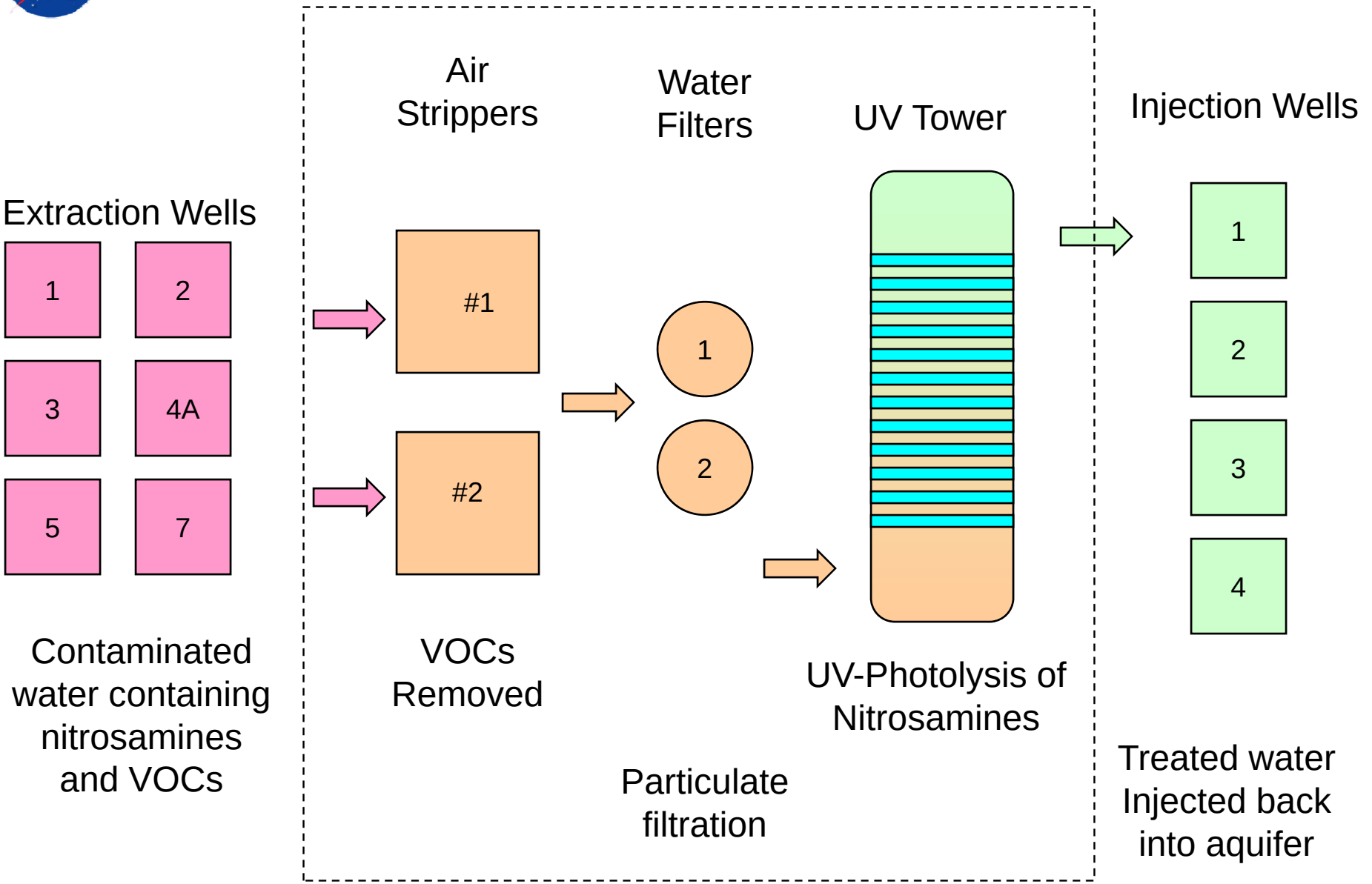
- A Staged Approach over ~60 years:
  - Attack the greatest risk to public health first
    - Stabilize the plume front (in progress)
  - Stop migration of contaminant into the front
    - Extraction and treatment at the Mid-Plume Constriction Area (~2009)
  - Stop migration into the Mid-Plume Constriction Area
    - Clean up the source areas (~2012-2015)


700 Area
300 Area
400 Area
100 Area
Jornada Del Muerto Basin
San Andres Mountains
Plume Front
Mid-Plume Constriction Area MPCA
Legend
TCE (1 ppb)
NDMA (10 ppt)
Freon 113 (1 ppb)
WSTF Boundary
Pipeline
Extraction Wells
Injection Wells
Drinking Water Wells
Miles
0 0.25 0.5 1
N

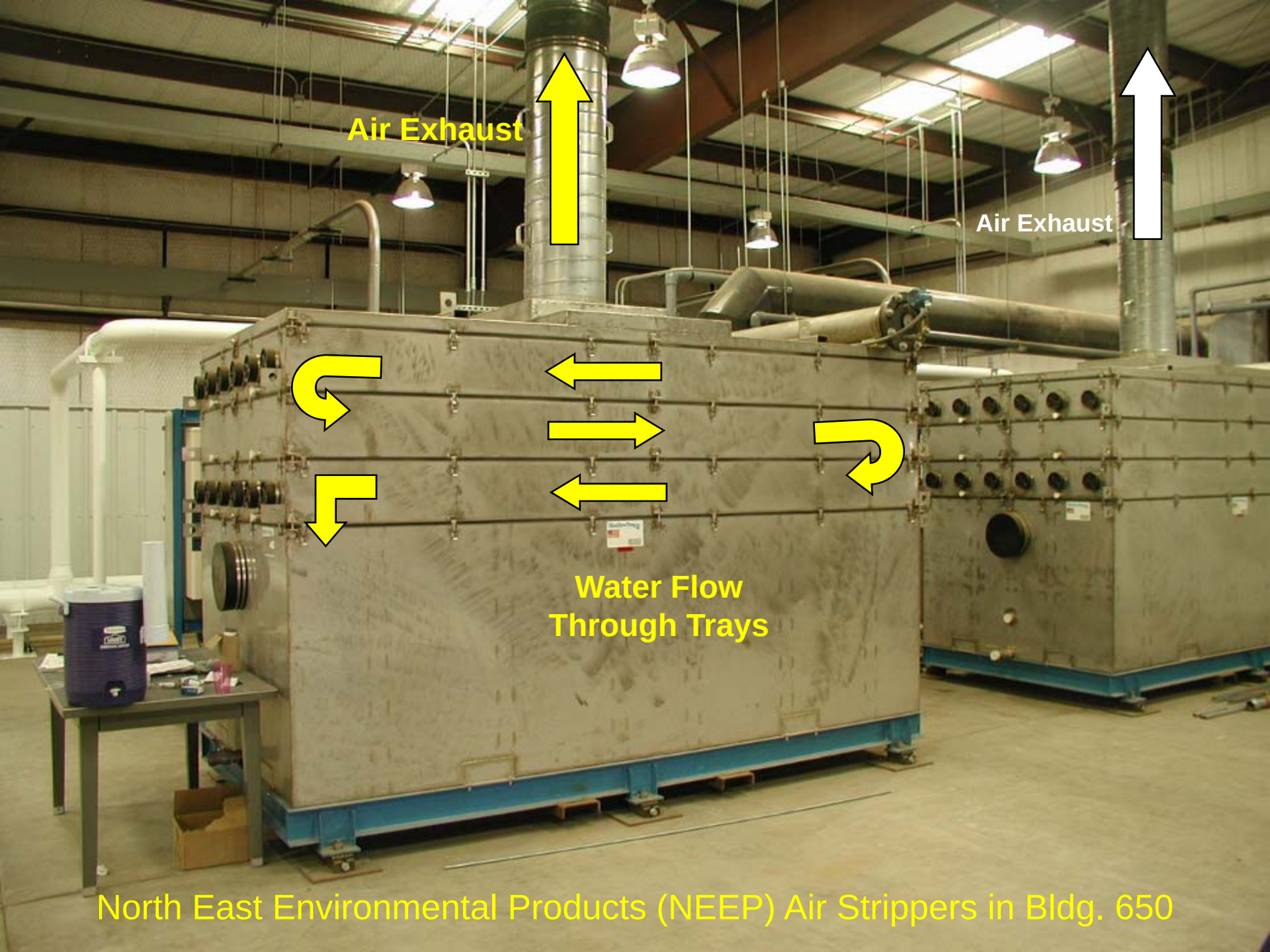
Plume Front Treatment System

- Containment & Partial Restoration:
  - Stop westward movement of the plume to protect drinking water and irrigation wells
    - Extract the contaminated water from the aquifer
    - Remove chemicals using best available technology
    - Return (inject) the treated water back to the aquifer
- The Plume Front Treatment System is operational

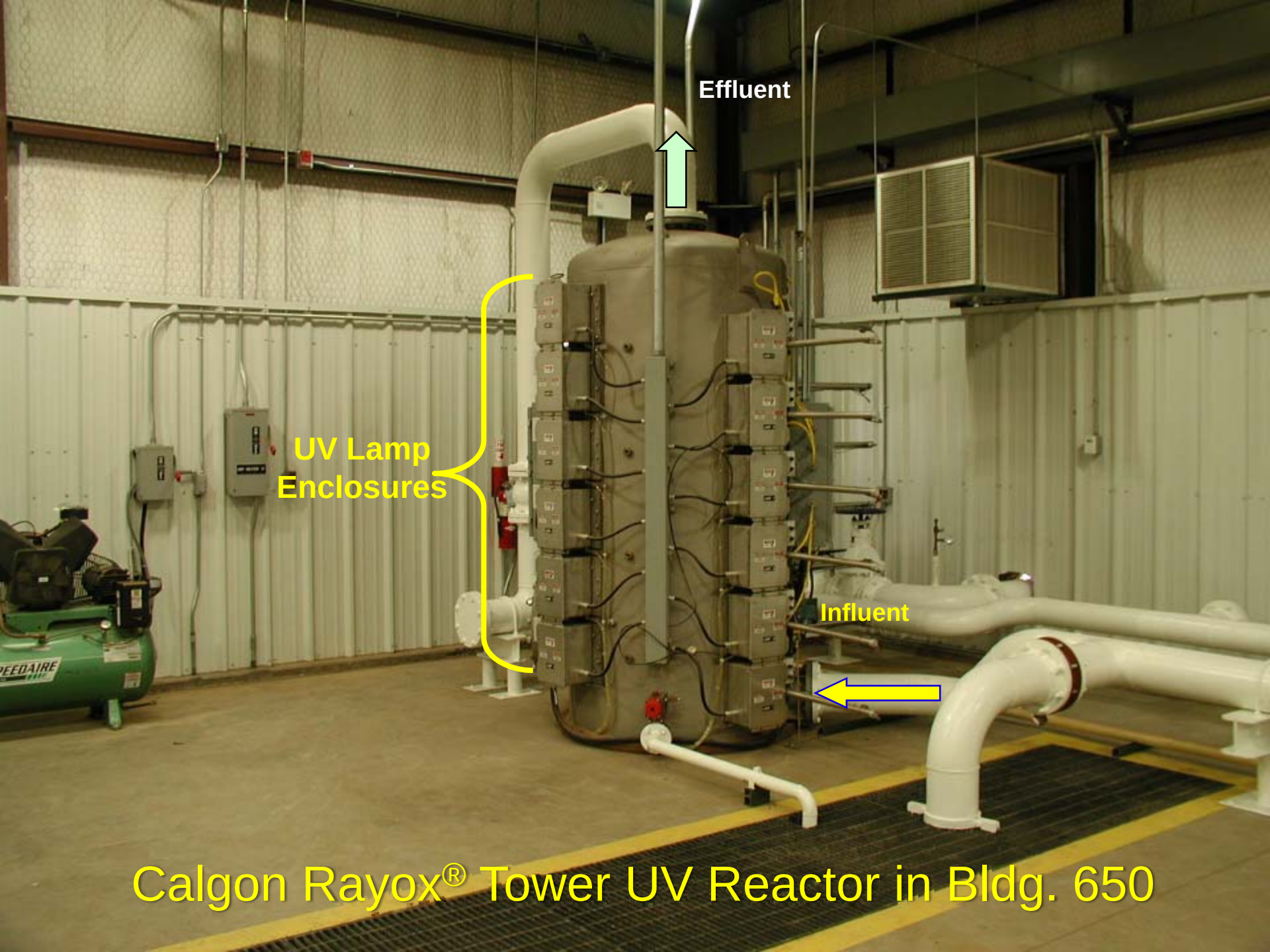
NASA White Sands Test Facility



Plume Front Treatment System



North East Environmental Products (NEEP) Air Strippers in Bldg. 650



Calgon Rayox® Tower UV Reactor in Bldg. 650

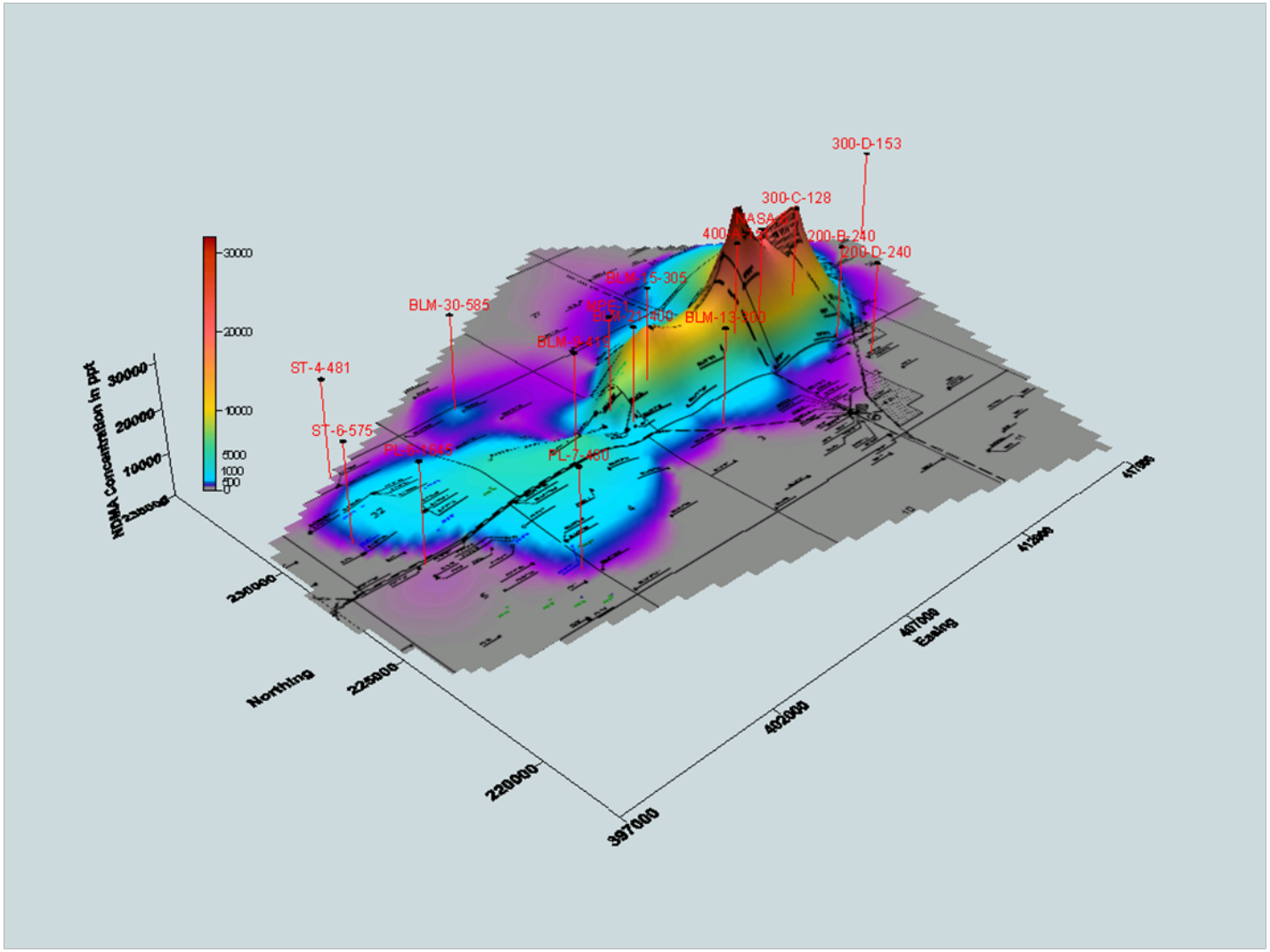
Renewable Energy

- PFTS electrical costs ~ $300-500K/yr for ~1MW
- Energy Storage Unit – FY08
- Concentrated solar collection system – FY10
- Wind - TBD
  - Initial investment of $6M

Mid-Plume Interception Treatment System

- Containment & Partial Restoration:
  - Stop migration of contaminant into the front using best available technology
  - Evaluate new technology such as bioremediation
    - Potential to accelerate cleanup
    - Peer review panel of recognized experts in these fields
- Design Process
  - Completed December 2008

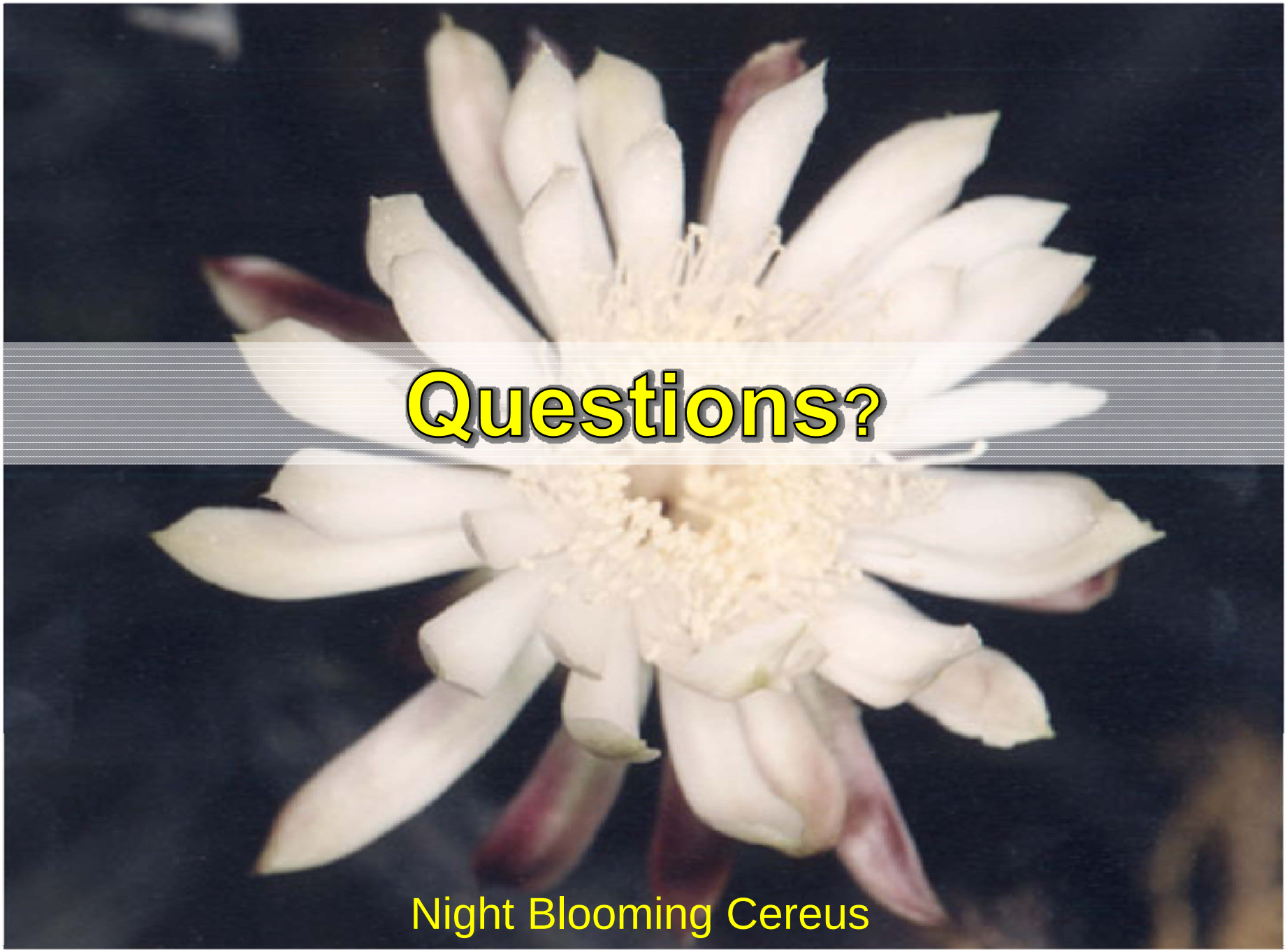
NDMA Concentration in ppt (Using Surfer 8.0)



Containment & Partial Restoration

Remediate Source Areas

- Post Closure Care Permit No. NM8800019434-2
- Application fee: ~$470K/10yr
- Operational costs: ~$4M/yr
- Remediation costs: ~$2M+
- Work plans: ~2009-2012
- Challenge: Treatment levels



Night Blooming Cereus